MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

PPS0025 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Business)

09 MARCH 2017
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with **FOUR** questions.
2. Attempt **ALL** four questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. **Formula** is provided at the back of the question paper.
5. **Statistical table** is provided.

Question 1

a. The manager of a large computer network has developed the following probability distribution of the number of interruptions per day:

Interruption (X)	0	1	2	3	4	5	6
$P(X)$	0.14	$2a$	$a+0.12$	$a-0.05$	0.22	0.02	0.01

i. Find the value of a. (3 marks)

ii. What is the probability that X is an odd number? (2 marks)

iii. Compute the expected number of interruptions per day. (3 marks)

iv. Compute the standard deviation. (4 marks)

b. $$f(x)=\begin{cases} k(x+2), & -2\le x\le 0 \\ \frac{1}{2}k(3-x), & 0<x\le 2 \\ 0, & \textit{otherwise} \end{cases}$$

i. Evaluate k. (4 marks)

ii. Evaluate $P(-1<x<1)$. (4 marks)

iii. Compute the mean of $f(x)$. (5 marks)

(Total = 25 marks)

Question 2

a. A company manufactures large LCD screens knows that there is no all pixels on their screen light, even if they spend great care when making them. In a sheet of 6 *ft* by 10 *ft* that will be cut into smaller screens, they find an average of 4.8 blank pixels. They believe that the occurrences of blank pixels are independent. Their warranty policy states that they will replace any screen sold that showed more than 3 blank pixels.

i. What is the mean number of blank pixels per square foot? (1 mark)

ii. What is the standard deviation of blank pixels per square foot? (2 marks)

iii. What is the probability that a 2 *ft* by 3 *ft* screen will have at least two defects? (3 marks)

iv. What is the probability that a 2 *ft* by 3 *ft* screen will be replaced because of blank pixels? (2 marks)

Continued...

b. In a survey conducted by the Human Resource Management, 68% of workers said that employers have the right to monitor their telephone usage. Suppose that a random sample of 20 workers is selected and they are asked if employers have the right to monitor telephone usage. What is the probability that

i. 10 or less of the workers agree? (3 marks)

ii. between 9 to 15 workers agree? (3 marks)

iii. less than 4 workers not agree? (2 marks)

c. An orange juice producer buys all his oranges from a large orange grove. The amount of juice squeezed from each of these oranges is approximately normally distributed, with a mean of 4.70 ounces and a standard deviation of 0.30 ounce.

i. What is the probability that a randomly selected orange will contain between 4.50 and 5.00 ounces of juice? (4 marks)

ii. 77 % of the oranges will contain at least how many ounces of juice? (5 marks)

(Total = 25 marks)

Question 3

a. The following data represent the weight of all six pumpkins (in pounds) displayed in a carnival "guess the weight" game booth.

Pumpkin	U	V	W	X	Y	Z
Weight (in pounds)	19	14	15	9	10	17

List all the possible samples of five pumpkins (without replacement) from this population and construct the sampling distribution of the sample mean. Then, find the sampling error for each sample.

(15 marks)

b. A bottling company uses a machine to fill the bottles with olive oil. The bottles are designed to contain 475 milliliters (ml). In fact, the contents vary according to a normal distribution with a mean of 473 ml and a standard deviation of 8 ml.

i. What is the mean, and the standard deviation of the sample mean of 33 randomly selected bottles? (3 marks)

ii. What is the probability that the mean of 33 bottles is less than the population mean by 3 ml? (4 marks)

iii. What is the probability that the mean of 10 bottles is more than 465 ml? (3 marks)

(Total = 25 marks)

Continued...

Question 4

a. A dealer in recycled paper places empty trailers at various sites. The trailers are gradually filled by individuals who bring in old newspapers and magazines, and are picked up on several schedules. One such schedule involves pickup every second week. This schedule is desirable if the average amount of recycled paper is more than 1,600 cubic feet per 2-week period. The dealer's records for **forty** 2-week periods at a particular site yields a mean of 1,718.3 cubic feet and a standard deviation of 137.8.

i. Construct a 99% confidence interval of μ. (5 marks)

ii. Is there strong evidence that μ is greater than 1,600 cubic feet at a 0.0005% level of significance? (10 marks)

b. A research study measured the pulse rates of 75 college men and found a mean pulse rate of 70.4211 beats per minute with a standard deviation of 9.9480 beats per minute. Researchers want to know if the mean pulse rate for all college men is different from the current standard of 72 beats per minute. What can the researchers conclude at a 3% significance level? (10 marks)

(Total = 25 marks)

End of page

Formula:

1.

	Mean	Variance
Discrete Random Variable *X*	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable *X*	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \frac{e^{-\lambda}\lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x: $z = \frac{x - \mu}{\sigma}$

4. The z value for a value of $\bar{x}$: $z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. Sampling error = $\bar{x} - \mu$

Non-sampling error = incorrect $\bar{x}$ − correct $\bar{x}$

6. Point estimate of $\mu = \bar{x}$

Margin of error = $\pm 1.96\sigma_{\bar{x}} = \pm 1.96\frac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96\frac{s}{\sqrt{n}}$

7. The $(1-\alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

$\bar{x} \pm z s_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \frac{s}{\sqrt{n}}$